CLAIMS

1. An optical security element (1) having a substrate layer (14), wherein a relief structure (17) defined by relief parameters, in particular relief shape, relief depth, spatial frequency and azimuth angle, is shaped in a surface region (21, 27, 33, 4, 50, 7, 65) of the substrate layer, which region is defined by an X-axis and a Y-axis, for producing an optically perceptible effect,

characterised in that

one or more of the relief parameters defining the relief structure in the surface region (21, 27, 33, 4, 50, 7, 65) are varied in accordance with a parameter variation function (54. 54, 55), that the surface region (21, 27, 33, 4, 50, 7, 65) is divided into one or more pattern regions (23, 30, 29, 35, 502, 74, 66) and a background region (22, 28, 34, 501, 73, 66), and that one or more of the relief parameters defining the relief structure (17) in the one or more pattern regions (23, 29, 30, 35, 502, 74, 67) are varied in accordance with a parameter variation function which is phase-displaced in relation to the parameter variation function of the background region (22, 28, 34, 501, 73, 66).

2. An optical security element according to claim 1 characterised in that the parameter variation function (54, 54, 55) is a periodic parameter variation function (54, 54, 55) and one or more of the relief parameters defining the relief structure are varied in the surface regions (21, 27, 33, 4, 50, 7, 65) periodically in accordance with the periodic parameter variation function (54, 54, 55).

3. An optical security element according to claim 2 characterised in that the period (25, 56, 63, 93) of the parameter variation function (53, 54, 55) is less than 300 μm, and in particular is taken from the range of 20 to 200 μm.

4. An optical security element according to one of the preceding claims characterised in that the phase displacement of the parameter variation function between the pattern region and the background region is about 180 degrees.

5. An optical security element according to one of the preceding claims characterised in that the phase displacement of the parameter variation function between the pattern region and the background region is selected in accordance with the contrast to be set.

6. An optical security element according to one of the preceding claims characterised in that the relief structure is a diffraction grating whose azimuth angle is varied periodically in accordance with the parameter variation function.

7. An optical security element according to claim 6 characterised in that the mean azimuth angle in relation to the resolution capacity of the human eye is constant.

8. An optical security element according to one of claims 6 and 7 characterised in that the parameter variation varies the azimuth angle of the diffraction grating (28, 33) periodically in dependence on the value of the X-axis.

9. An optical security element according to claim 8 characterised in that the parameter variation function varies the azimuth angle of the diffraction grating (28) in such a way that the diffraction grating is composed of a plurality of serpentine line-shaped lines.

10. An optical security element according to claim 9 characterised in that the parameter variation function is a sine function which varies the azimuth angle of the diffraction grating (28) in dependence on the value of the X-axis.

17. An optical security element according to claim 16 characterised in that the parameter variation function is a sawtooth function (53), a triangular function (54) or a sine function (55).

18. An optical security element according to one of the preceding claims characterised in that the relief structure (17) is a diffraction grating (61) whose profile depth is varied periodically in accordance with the parameter variation function.

19. An optical security element according to claim 18 characterised in that the parameter variation function varies the profile depth of the diffraction grating (61) periodically between a maximum depth, preferably 300 nm, and a minimum depth, preferably 50 nm, in dependence on the value of the X-axis.

20. An optical security element according to one of claims 18 and 19 characterised in that the parameter variation function is a triangular, rectangular or sine function.

21. An optical security element according to one of the preceding claims characterised in that the relief shape (75, 76) is varied periodically in accordance with the parameter variation function.

22. An optical security element according to claim 21 characterised in that the relief shape is varied periodically between two asymmetrical, mutually mirror-symmetrical relief shapes (75, 76).

23. An optical security element according to one of the preceding claims characterised in that the width of the troughs of the relief structure is varied periodically in accordance with the parameter variation function.

24. An optical security element according to one of claims 1 to 5 characterised in that the relief structure is a macrostructure with a spatial frequency of less than 300 lines per millimetre.

25. An optical security element according to one of the preceding claims characterised in that the mean azimuth angle of the relief structure (17) respectively corresponds to the azimuth angle of an associated verification grating (101 to 106).

26. An optical security element according to one of the preceding claims characterised in that the phase displacement between the background region and the pattern region is accompanied by a further function change.

27. A system for visualising items of concealed information comprising a security element (1) having a substrate layer (14) in which a relief structure (17) defined by relief parameters, in particular relief shape, relief depth, spatial frequency and azimuth angle, is shaped in a surface region (21, 27, 33, 4, 50, 7, 65) of the substrate layer (14), which region is defined by an X-axis and a Y-axis, for producing an optically perceptible effect,

characterised in that

one or more of the relief parameters defining the relief structure in the surface region (21, 27, 33, 4, 50, 7, 65) are varied periodically in accordance with a periodic parameter variation function, that the surface region is divided into one or more pattern regions (23, 30, 29, 35, 502, 74, 66) and a background region (22, 28, 34, 501, 73, 66), that one or more of the relief parameters defining the relief structure in the one or more pattern regions are varied in accordance with a parameter variation function which is phase-displaced in relation to the parameter variation function of the background region, and that the system further has a verification element (20, 57, 101) which has a verification grating which is

11. An optical security element according to one of claims 6 to 8 characterised in that the parameter variation function varies the azimuth angle of the diffraction grating (4) periodically in dependence on the value of the X-axis and the value of the Y-axis.

12. An optical security element according to claim 11 characterised in that the parameter variation function varies the azimuth angle of the diffraction grating in such a way that the diffraction grating (4) is composed of a plurality of lines arranged in concentric circles.

13. An optical security element according to one of claims 6 to 12 characterised in that the diffraction grating has a spatial frequency of more than 300 lines per mm, in particular a spatial frequency of 800 to 1200 lines per mm.

14. An optical security element according to one of the preceding claims characterised in that the relief structure (17) is a diffraction grating (50) whose spatial frequency is varied periodically in accordance with the parameter variation function (53, 54, 55).

15. An optical security element according to claim 14 characterised in that the mean spatial frequency in relation to the resolution capacity of the human eye is constant.

16. An optical security element according to claim 14 or claim 15 characterised in that the parameter variation function (53, 54, 55) varies the spatial frequency (50) periodically between a maximum frequency, preferably 1200 lines per mm, and a minimum frequency, preferably 800 lines per mm, in dependence on the value of the X-axis.

defined by a periodic transmission function and whose period corresponds to the period of the parameter variation function.

28. A system according to claim 27 characterised in that the transmission function is a non-binary transmission function, in particular a sine function.